TRITIUM LOSS AT REDUCED PRESSURES IN A HYDROGEN ATMOSPHERE

The apparatus in Fig. I was used to encapsulate tritium foils in a glass envelope under a hydrogen atmosphere at various pressures. The purpose of such an investigation was to gain insight into what losses in activity might reasonably be expected if tritium foils were used as the ionizing radiation sources in space flight applications, particularly the gas chromatographic experiments.

Experimental

A tritium foil was cut to the dimensions 1.1 cm x 0.8 cm and placed in a conventional 1 mm parallel plate cross-section ionization detector. The specific activity of the tritium foil was 1 curie/in^2 so that a foil of these dimensions would be approximately 130 millicuries. The ionization current in hydrogen was determined. This current value is used as an indication of the source strength.

Having been tested as to approximate activity the source was placed in a glass capsule (C) and this in turn connected to a hydrogen cylinder, vacuum pump and absolute pressure indicator as indicated in Fig. I. The capsule (C) was completely evacuated then filled with hydrogen three times to assure the removal of most gaseous contaminants. The capsule was next evacuated until the pressure was 1 mm absolute pressure. Hydrogen was slowly admitted until the desired pressure was reached. The system was allowed to come to equilibrium and the capsule was sealed at point A.

Thus prepared the radioactive sources were allowed to remain for six months at which time they were removed and the current again measured as previously outlined. The samples were again encapsulated and left for an additional three months. A final current measurement was performed. The results are given in Table I.

Conclusion:

The loss of activity from the tritium foils tested due to reduced pressure and hydrogen encapsulation was not significant and therefore should pose no problem for use in space flight applications. The data indicates that minor losses will occur due to reduced pressure operation but they will not be of sufficient order of magnitude to warrant further consideration. A single measurement of ionization current prior to sample analysis will enable one to correct for losses that might have occurred during transit time of a space vehicle.

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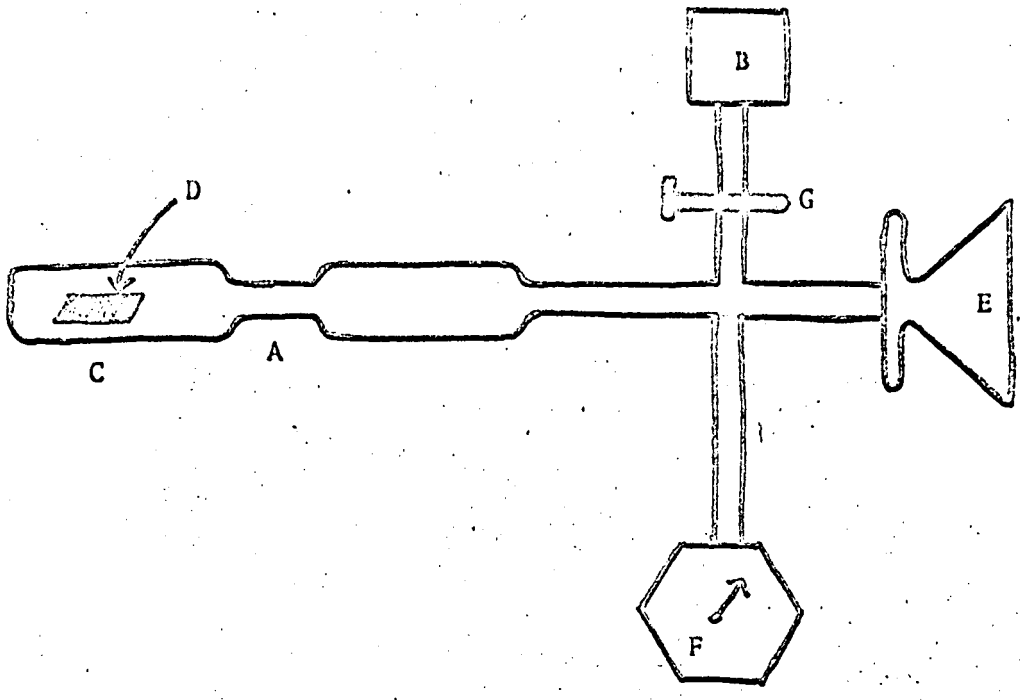
FIGURE I



A = Sealing Point

B = Hydrogen

C = Glass Capsule

D = Tritium Foil

E = Vacuum

F = Absolute Pressure Indicator

G = Needle Valve